Memo to: Toru Hamayasu, Project Executive
From: Simon Zweighaft, Chief Project Officer
Subject: Justification of Current Estimated Rail Fleet Size
Date: October 16, 2008

We have been asked to provide an explanation of how we arrived at our vehicle fleet size and cost estimates. While it would be desirable to have all information regarding the vehicle configuration tied down, and fully consistent both internally and with TCRP 100 Transit Capacity and Quality of Service Manual, that is not something we can completely accomplish at this pre-preliminary engineering stage of development. What we are currently showing in the EIS is the following:

1. The rail car fleet will consist of 60 to 65 vehicles.
2. 2030 peak hour peak direction ridership will be 6200 at the highest link.
3. Our cost estimate for vehicles of $330,000,000 in year of purchase dollars.
4. The operating headway will be 3 minutes.

Other information that is relevant to the fleet size is as follows:

1. A complete round trip over the length of the line is about 80 minutes, including end turnaround and station dwells.
2. We are planning a light metro type car which would be approximately 60 feet in length and 10 feet wide.
3. Using TCRP 100 guidelines, a planning capacity of 150 to 155 passengers per vehicle was calculated, based on 3.2 square feet per standing passenger (0.3 square meter/passenger.
4. Our 2018 opening year ridership forecast at the peak link is 5028 pphpd.

To meet the nominal 3 minute headway criterion the fleet requirement from opening year 2018 to 2030, we expect the active fleet will be between 60 and 65 cars. This total is sufficient to accommodate the peak service requirement, including a ready train, and a spare ratio of about 20%. The final configuration of end and middle cars will be determined in preliminary engineering phase. However one option is to purchase a total of 5 middle cars and 56 end cars. In this scenario we would have 52 cars operating on the system in 24 trains. This is a spare ratio of 20% for the middle cars and 17% for the end cars. FTA has suggested that an overall ratio including 20% spares would be appropriate and this is a somewhat short of that, but actually we would be providing a bit more capacity than the travel demand model requires. As a matter of fact, in opening years we would be providing a considerably higher capacity than required if we use the middle cars in the service.

The cost estimate for these cars in the budget is $266 million in 2007 dollars. At an estimated cost of $4 million per copy this would be $244 million leaving $22 million for spare parts and engineering. The budgeted $4 million in 2007 dollars is a high estimate for this short, rigid, high platform car.

One other matter that comes into play in the TCRP 100 report is the Peak Hour Factor PHF. Applying a PHF of 0.8 to our 150 passenger car and 44 cars per hour yields a peak link capacity of 5280 pphpd which is sufficient for the initial operations. Applying this same formula but using the maximum design load (190 passengers at 4 ppm^2) as suggested in the TCRP document yields a peak link capacity of 6688 which is sufficient for the design year. If a serious crowding problem arose between the opening year and the design year, there would, of course be an opportunity to purchase additional vehicles to respond to the issue.

There are other examples we could develop to demonstrate the adequacy of our cost estimate for vehicles. The vehicle could be a bit larger, say 65 feet long instead of 60 feet. The estimated cost per car could be a bit lower and still be within a reasonable range. We could operate on a slightly longer headway and increase the spares ratio. The problem is these are all a bit speculative until we have the opportunity to refine our engineering and operations plans. The project team will continue to refer to TCRP 100 as we proceed through preliminary engineering, as well as, work with the various suppliers to further define the most appropriate vehicle for our project.

With your permission I intend to send this memo to our colleagues at FTA, Jacobs and Booz Allen in addition to a typical internal distribution.